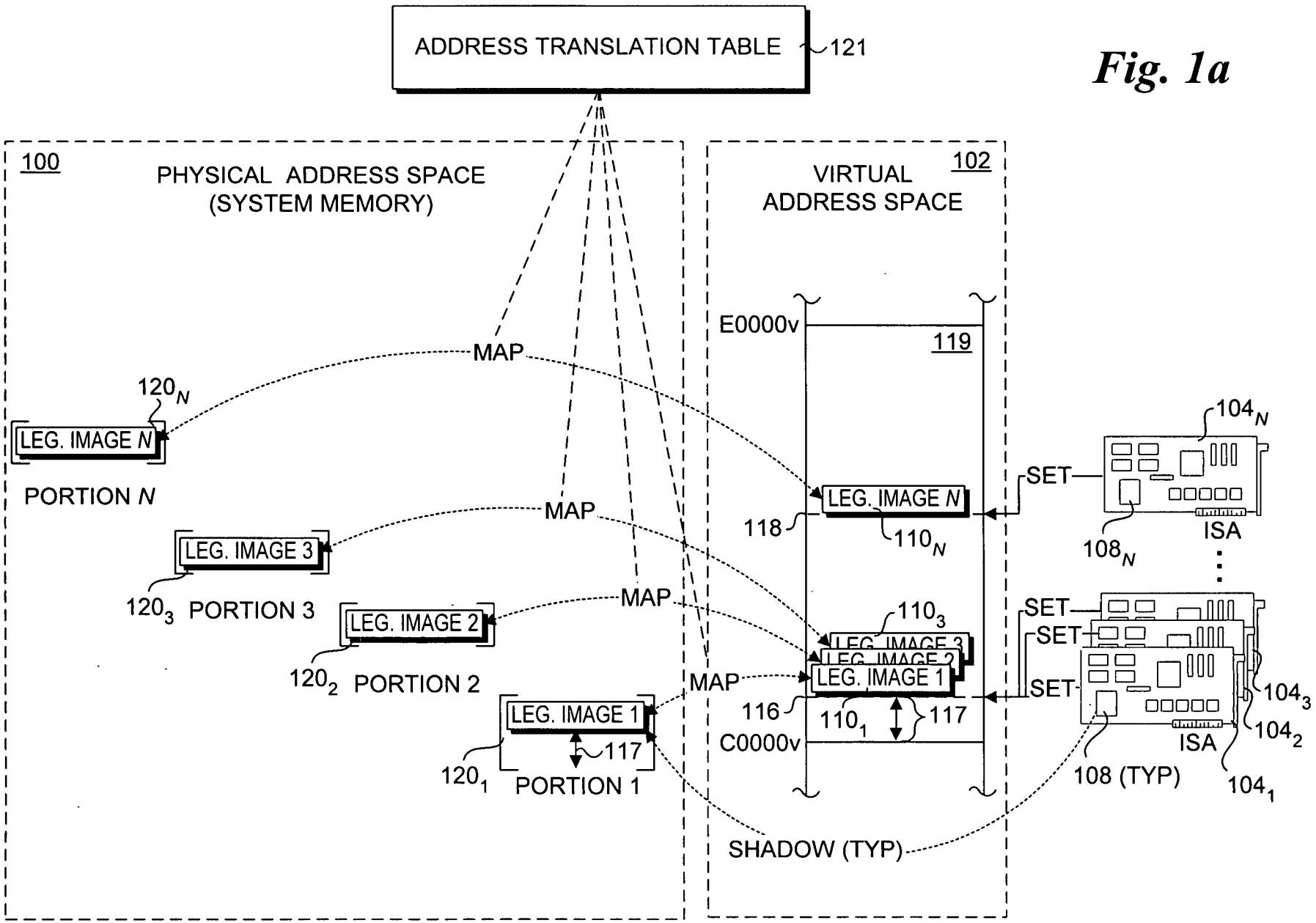
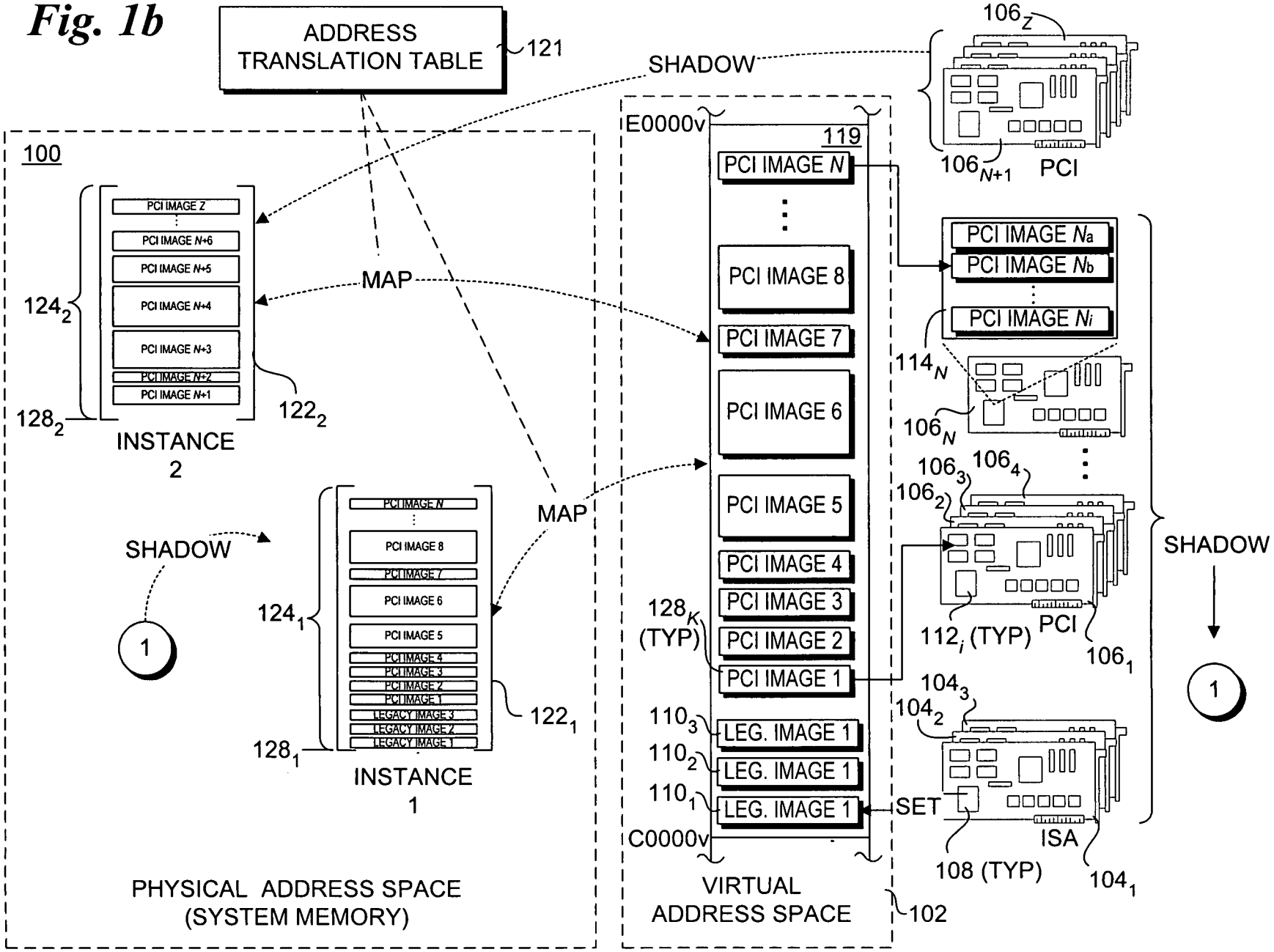

ADDRESS TRANSLATION TABLE
121
100
PHYSICAL ADDRESS SPACE
(SYSTEM MEMORY)
102
VIRTUAL
ADDRESS SPACE
E0000v
119
MAP
120N
LEG. IMAGE N
PORTION N
LEG. IMAGE N
118
110N
SET
104N
108N
ISA
MAP
LEG. IMAGE 3
120₃ PORTION 3
MAP
LEG. IMAGE 2
120₂ PORTION 2
110₃
LEG. IMAGE 3
LEG. IMAGE 2
LEG. IMAGE 1
SET
SET
SET
MAP
LEG. IMAGE 1
117
120₁ PORTION 1
116
110₁
117
C0000v
104₃
104₂
ISA
108 (TYP)
104₁
SHADOW (TYP)

*Fig. 1a*

*Fig. 1b*


ADDRESS TRANSLATION TABLE
121
SHADOW
100
PCI IMAGE Z
PCI IMAGE N+6
PCI IMAGE N+5
PCI IMAGE N+4
PCI IMAGE N+3
PCI IMAGE N+2
PCI IMAGE N+1
124 2
128 2
122 2
INSTANCE 2
MAP
MAP
SHADOW
1
PCI IMAGE N
PCI IMAGE 8
PCI IMAGE 7
PCI IMAGE 6
PCI IMAGE 5
PCI IMAGE 4
PCI IMAGE 3
PCI IMAGE 2
PCI IMAGE 1
LEGACY IMAGE 3
LEGACY IMAGE 2
LEGACY IMAGE 1
124 1
128 1
122 1
INSTANCE 1
PHYSICAL ADDRESS SPACE (SYSTEM MEMORY)
E0000v
119
PCI IMAGE N
PCI IMAGE 8
PCI IMAGE 7
PCI IMAGE 6
PCI IMAGE 5
PCI IMAGE 4
PCI IMAGE 3
PCI IMAGE 2
PCI IMAGE 1
128 K (TYP)
LEG. IMAGE 1
LEG. IMAGE 1
LEG. IMAGE 1
110 3
110 2
110 1
C0000v
VIRTUAL ADDRESS SPACE
102
106 Z
106 N+1
PCI
PCI IMAGE Na
PCI IMAGE Nb
PCI IMAGE Ni
114 N
106 N
106 3
106 4
106 2
112 i (TYP)
PCI
106 1
SHADOW
1
104 3
104 2
SET
ISA
108 (TYP)
104 1

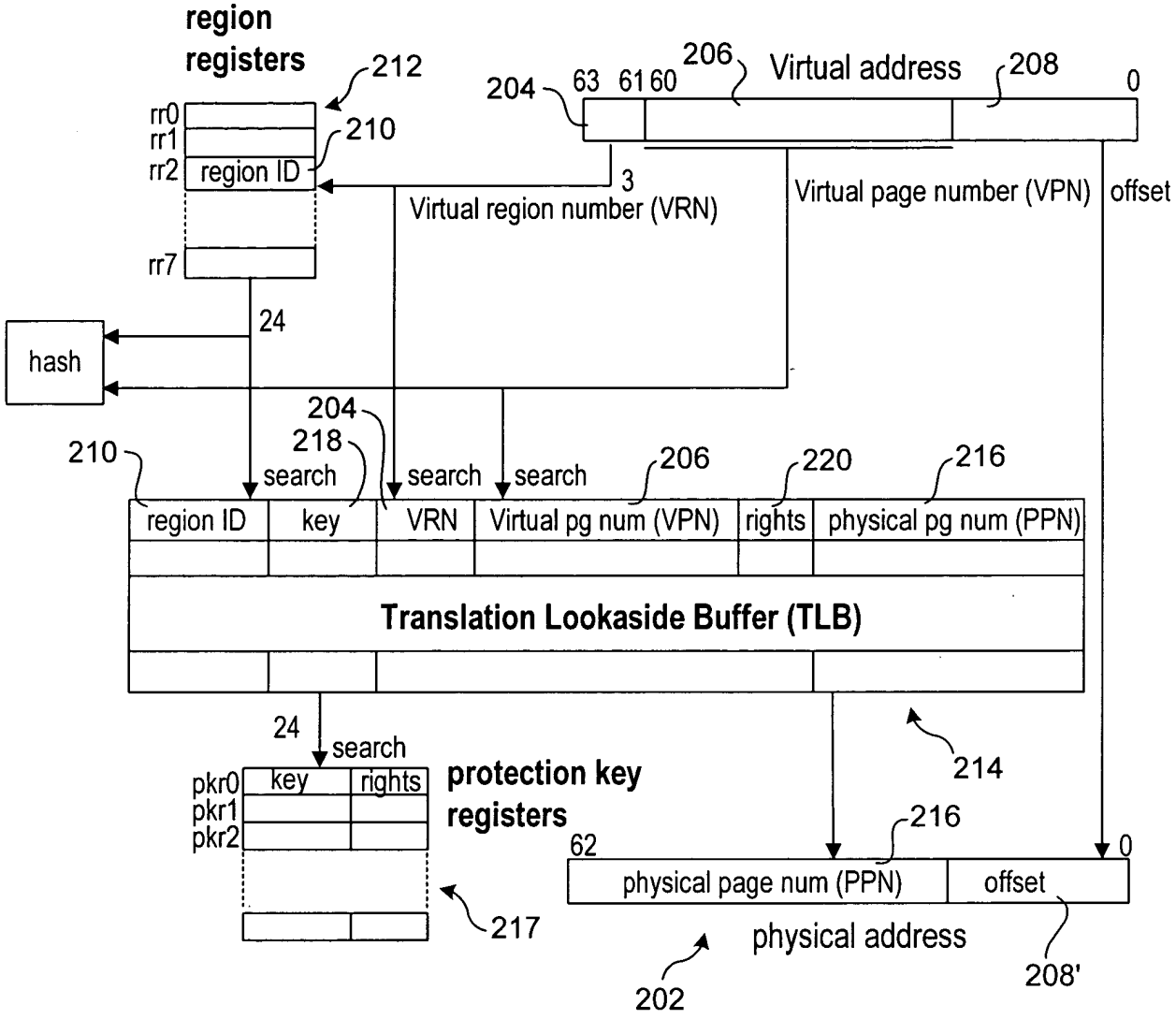

region registers
212
rr0
rr1
rr2
region ID
210
rr7
204
63 61 60
206
Virtual address
208
0
3
Virtual region number (VRN)
Virtual page number (VPN)
offset
24
hash
204
218
210
search
search
search
206
220
216
region ID
key
VRN
Virtual pg num (VPN)
rights
physical pg num (PPN)
Translation Lookaside Buffer (TLB)
24
search
214
pkr0
pkr1
pkr2
key
rights
protection key registers
216
62
0
physical page num (PPN)
offset
217
physical address
202
208'

*Fig. 2*

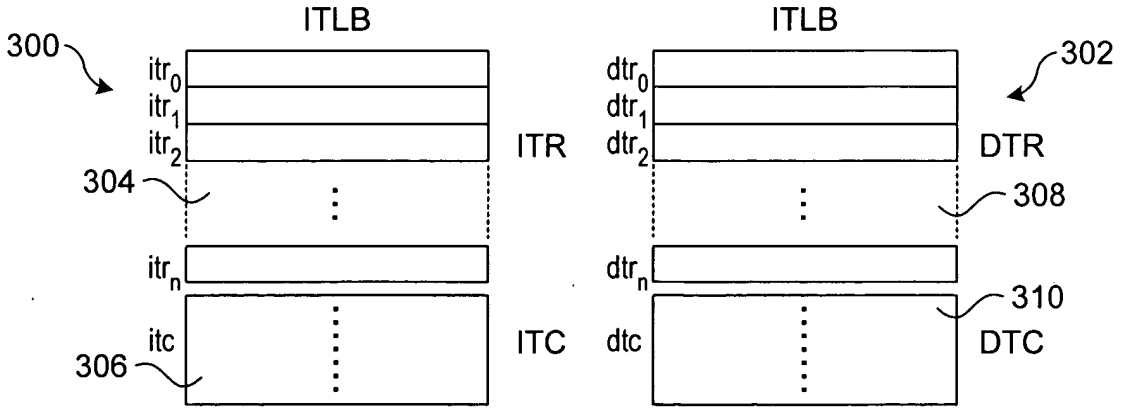

ITLB
300
itr0
itr1
itr2
ITR
304
itrn
itc
ITC
306
ITLB
302
dtr0
dtr1
dtr2
DTR
308
dtrn
310
dtc
DTC

*Fig. 3*

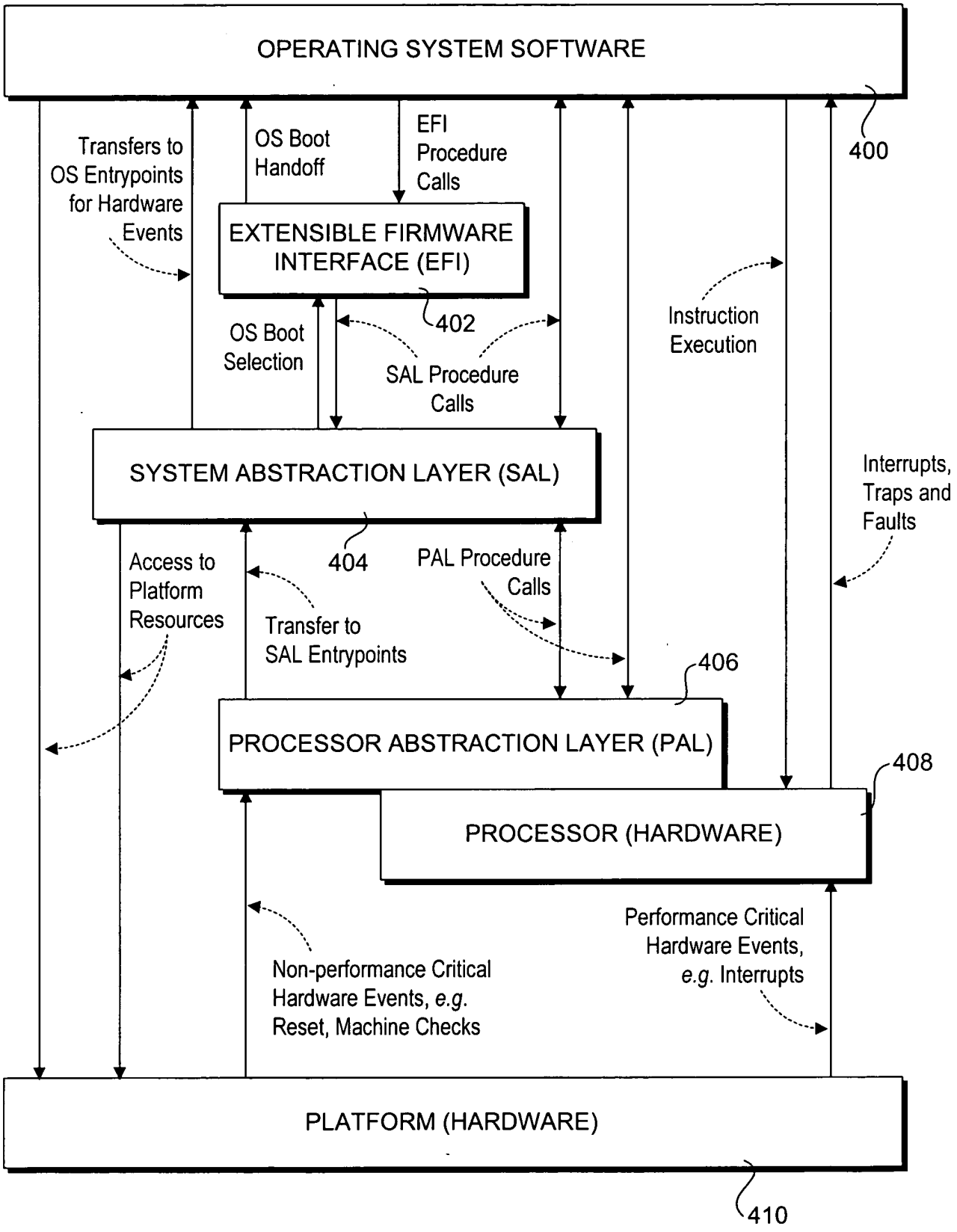

OPERATING SYSTEM SOFTWARE
400
Transfers to OS Entrypoints for Hardware Events
OS Boot Handoff
EFI Procedure Calls
EXTENSIBLE FIRMWARE INTERFACE (EFI)
402
OS Boot Selection
SAL Procedure Calls
Instruction Execution
SYSTEM ABSTRACTION LAYER (SAL)
404
Interrupts, Traps and Faults
Access to Platform Resources
Transfer to SAL Entrypoints
PAL Procedure Calls
406
PROCESSOR ABSTRACTION LAYER (PAL)
408
PROCESSOR (HARDWARE)
Performance Critical Hardware Events, e.g. Interrupts
Non-performance Critical Hardware Events, e.g. Reset, Machine Checks
PLATFORM (HARDWARE)
410

*Fig. 4*

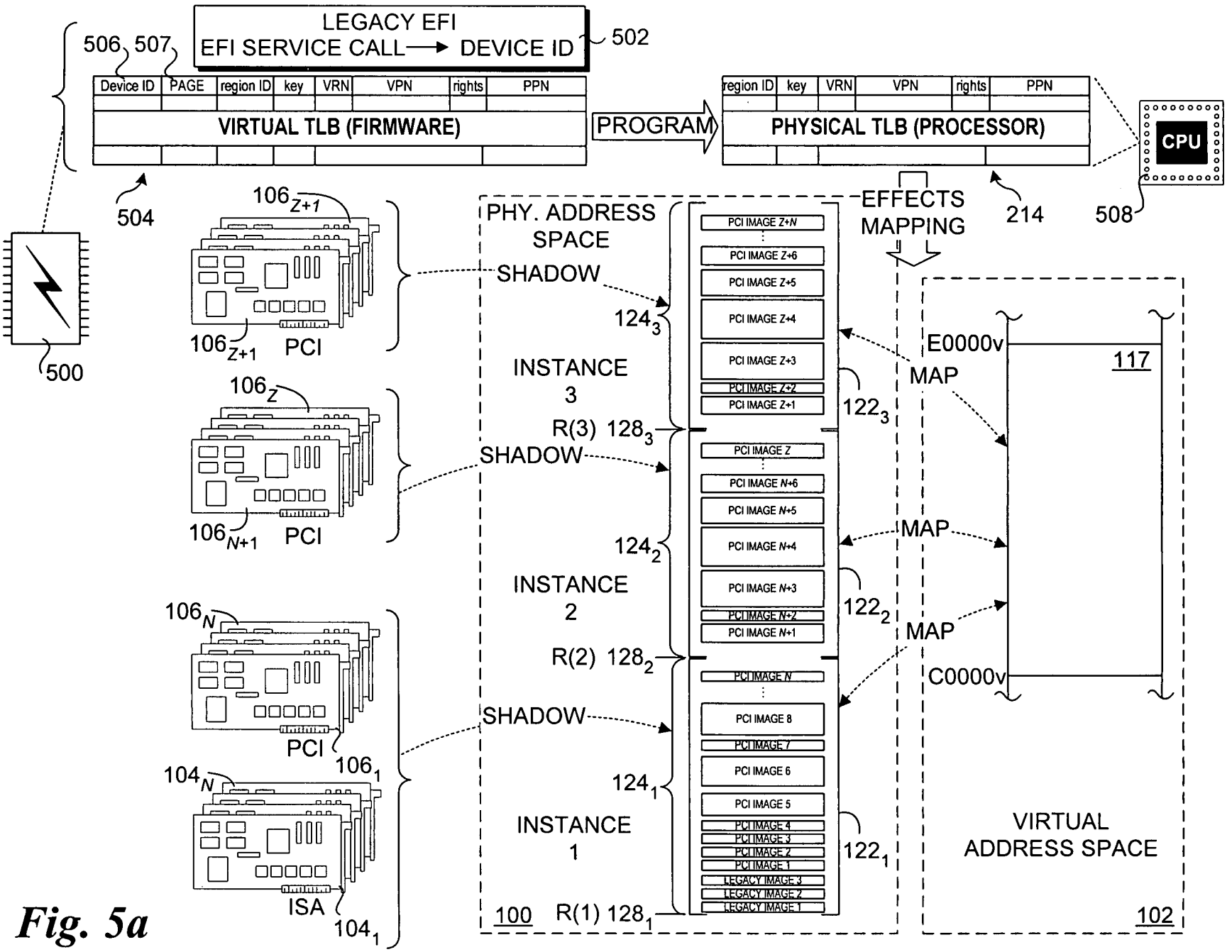

LEGACY EFI
EFI SERVICE CALL
DEVICE ID
502
506
507
Device ID
PAGE
region ID
key
VRN
VPN
rights
PPN
VIRTUAL TLB (FIRMWARE)
PROGRAM
PHYSICAL TLB (PROCESSOR)
CPU
504
214
508
EFFECTS MAPPING
500
PHY. ADDRESS SPACE
SHADOW
INSTANCE 3
INSTANCE 2
INSTANCE 1
R(3) 128_3
R(2) 128_2
R(1) 128_1
124_3
124_2
124_1
122_3
122_2
122_1
100
PCI
ISA
MAP
E0000v
C0000v
117
VIRTUAL ADDRESS SPACE
102

*Fig. 5a*

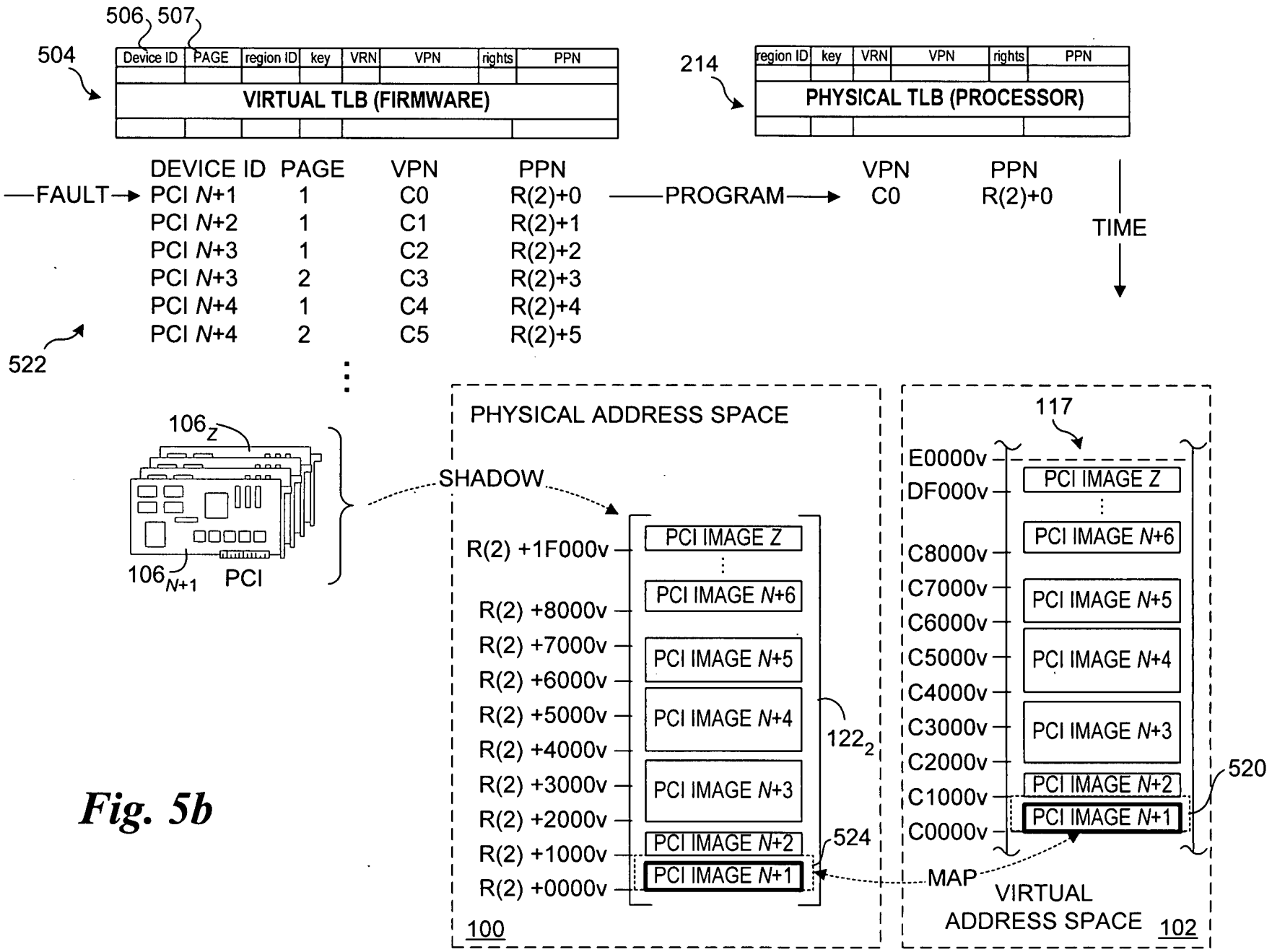

506
507
504
Device ID
PAGE
region ID
key
VRN
VPN
rights
PPN
VIRTUAL TLB (FIRMWARE)
214
region ID
key
VRN
VPN
rights
PPN
PHYSICAL TLB (PROCESSOR)
DEVICE ID
PAGE
VPN
PPN
FAULT
PCI N+1
1
C0
R(2)+0
PCI N+2
1
C1
R(2)+1
PCI N+3
1
C2
R(2)+2
PCI N+3
2
C3
R(2)+3
PCI N+4
1
C4
R(2)+4
PCI N+4
2
C5
R(2)+5
PROGRAM
VPN
C0
PPN
R(2)+0
TIME
522
106Z
106N+1
PCI
SHADOW
PHYSICAL ADDRESS SPACE
R(2) +1F000v
R(2) +8000v
R(2) +7000v
R(2) +6000v
R(2) +5000v
R(2) +4000v
R(2) +3000v
R(2) +2000v
R(2) +1000v
R(2) +0000v
PCI IMAGE Z
PCI IMAGE N+6
PCI IMAGE N+5
PCI IMAGE N+4
PCI IMAGE N+3
PCI IMAGE N+2
PCI IMAGE N+1
1222
524
100
117
E0000v
DF000v
C8000v
C7000v
C6000v
C5000v
C4000v
C3000v
C2000v
C1000v
C0000v
520
MAP
VIRTUAL
ADDRESS SPACE
102

*Fig. 5b*

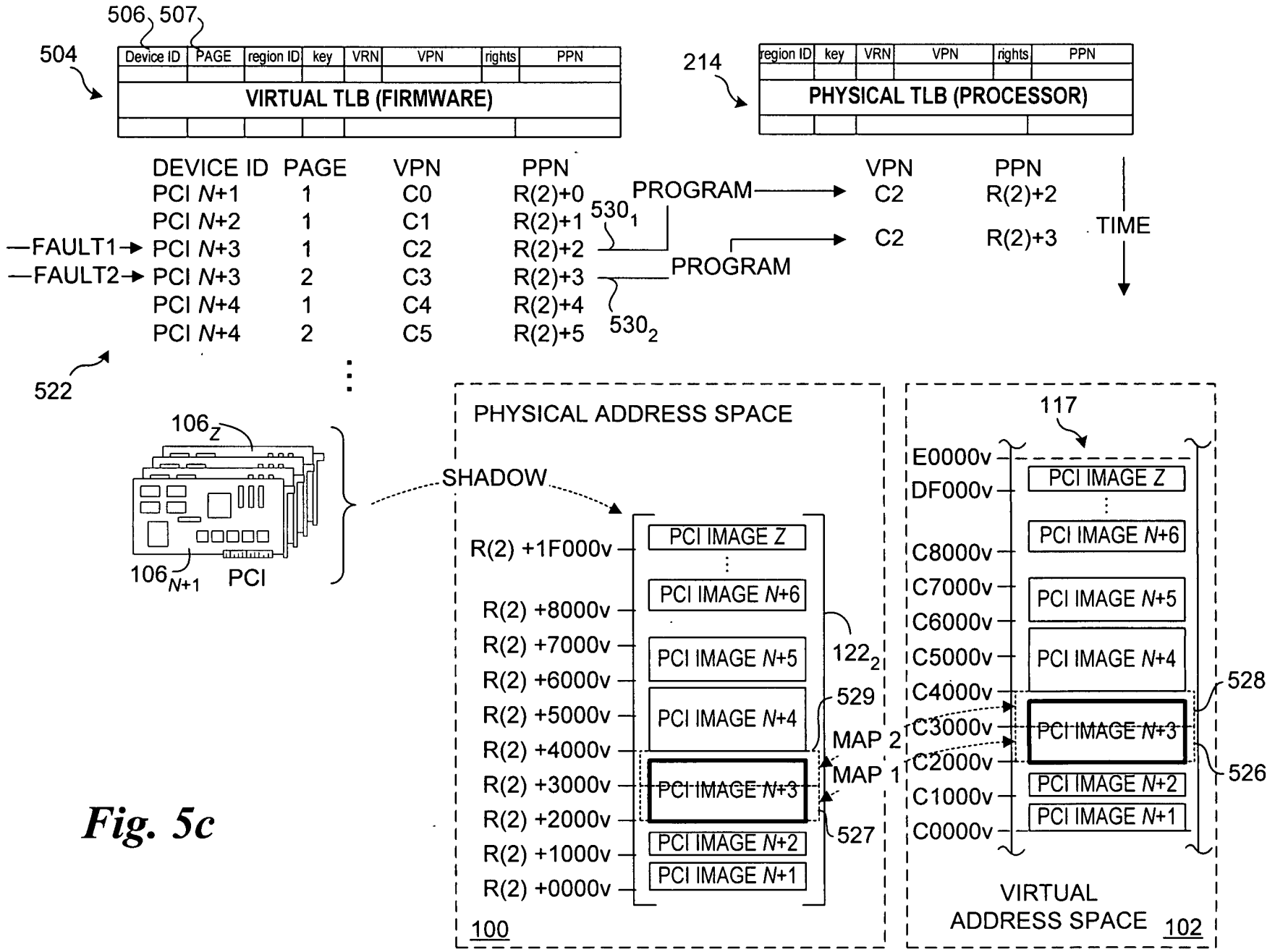

506
507
504
Device ID
PAGE
region ID
key
VRN
VPN
rights
PPN
VIRTUAL TLB (FIRMWARE)
214
region ID
key
VRN
VPN
rights
PPN
PHYSICAL TLB (PROCESSOR)
DEVICE ID
PAGE
VPN
PPN
PCI N+1 1 C0 R(2)+0
PCI N+2 1 C1 R(2)+1
FAULT1 PCI N+3 1 C2 R(2)+2
FAULT2 PCI N+3 2 C3 R(2)+3
PCI N+4 1 C4 R(2)+4
PCI N+4 2 C5 R(2)+5
PROGRAM
530 1
PROGRAM
530 2
VPN
PPN
C2
R(2)+2
C2
R(2)+3
TIME
522
106 Z
106 N+1
PCI
SHADOW
PHYSICAL ADDRESS SPACE
R(2) +1F000v
R(2) +8000v
R(2) +7000v
R(2) +6000v
R(2) +5000v
R(2) +4000v
R(2) +3000v
R(2) +2000v
R(2) +1000v
R(2) +0000v
PCI IMAGE Z
PCI IMAGE N+6
PCI IMAGE N+5
PCI IMAGE N+4
PCI IMAGE N+3
PCI IMAGE N+2
PCI IMAGE N+1
122 2
529
MAP 2
MAP 1
527
100
117
E0000v
DF000v
C8000v
C7000v
C6000v
C5000v
C4000v
C3000v
C2000v
C1000v
C0000v
PCI IMAGE Z
PCI IMAGE N+6
PCI IMAGE N+5
PCI IMAGE N+4
PCI IMAGE N+3
PCI IMAGE N+2
PCI IMAGE N+1
528
526
VIRTUAL
ADDRESS SPACE
102

*Fig. 5c*

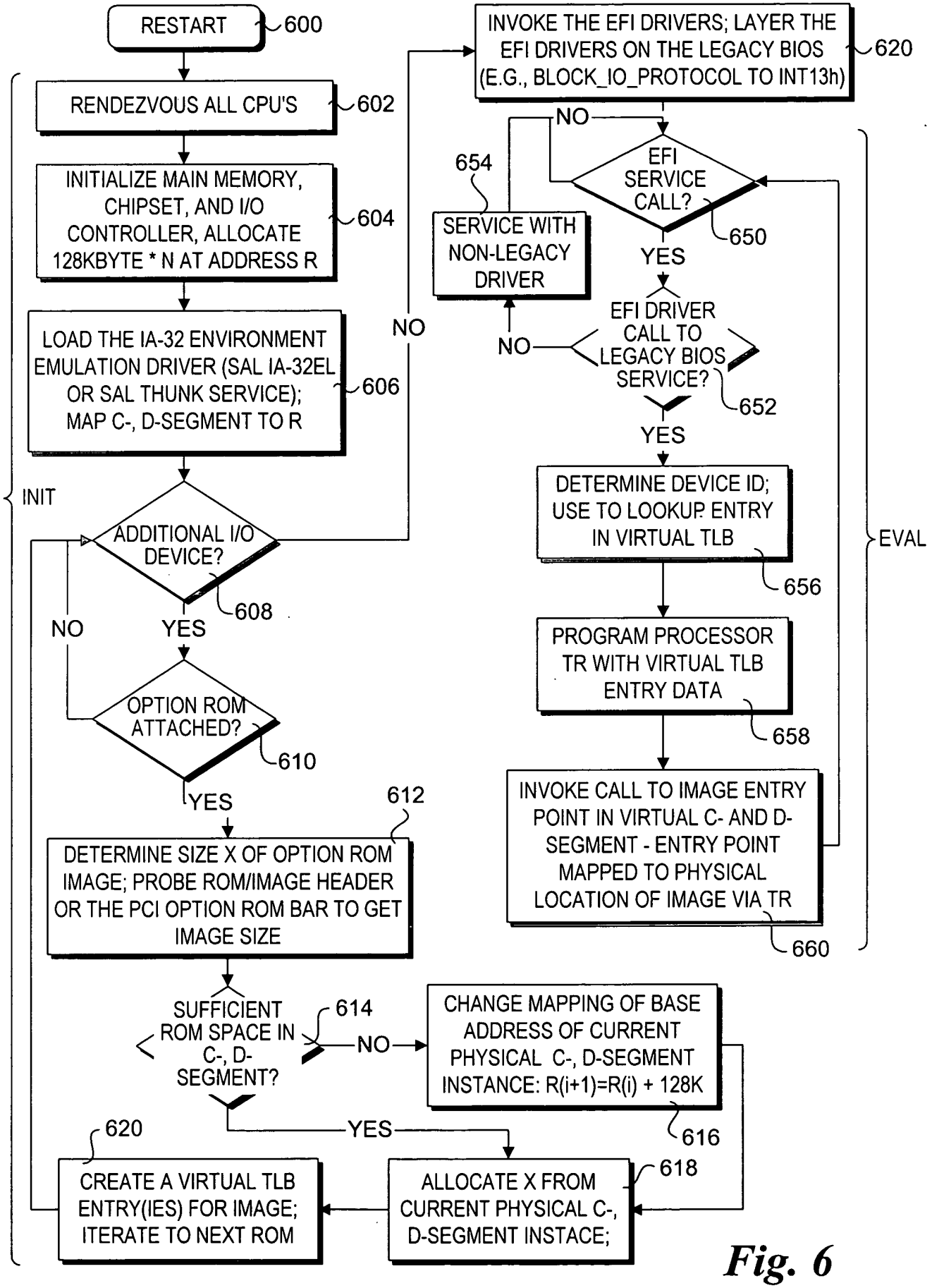

RESTART
600
RENDEZVOUS ALL CPU'S
602
INITIALIZE MAIN MEMORY, CHIPSET, AND I/O CONTROLLER, ALLOCATE 128KBYTE * N AT ADDRESS R
604
LOAD THE IA-32 ENVIRONMENT EMULATION DRIVER (SAL IA-32EL OR SAL THUNK SERVICE); MAP C-, D-SEGMENT TO R
606
INIT
ADDITIONAL I/O DEVICE?
608
NO
YES
OPTION ROM ATTACHED?
610
YES
612
DETERMINE SIZE X OF OPTION ROM IMAGE; PROBE ROM/IMAGE HEADER OR THE PCI OPTION ROM BAR TO GET IMAGE SIZE
SUFFICIENT ROM SPACE IN C-, D-SEGMENT?
614
NO
CHANGE MAPPING OF BASE ADDRESS OF CURRENT PHYSICAL C-, D-SEGMENT INSTANCE: R(i+1)=R(i) + 128K
616
YES
620
CREATE A VIRTUAL TLB ENTRY(IES) FOR IMAGE; ITERATE TO NEXT ROM
ALLOCATE X FROM CURRENT PHYSICAL C-, D-SEGMENT INSTACE;
618
NO
INVOKE THE EFI DRIVERS; LAYER THE EFI DRIVERS ON THE LEGACY BIOS (E.G., BLOCK_IO_PROTOCOL TO INT13h)
620
NO
EFI SERVICE CALL?
650
654
SERVICE WITH NON-LEGACY DRIVER
YES
EFI DRIVER CALL TO LEGACY BIOS SERVICE?
652
NO
YES
DETERMINE DEVICE ID; USE TO LOOKUP ENTRY IN VIRTUAL TLB
656
PROGRAM PROCESSOR TR WITH VIRTUAL TLB ENTRY DATA
658
INVOKE CALL TO IMAGE ENTRY POINT IN VIRTUAL C- AND D-SEGMENT - ENTRY POINT MAPPED TO PHYSICAL LOCATION OF IMAGE VIA TR
660
EVAL

*Fig. 6*

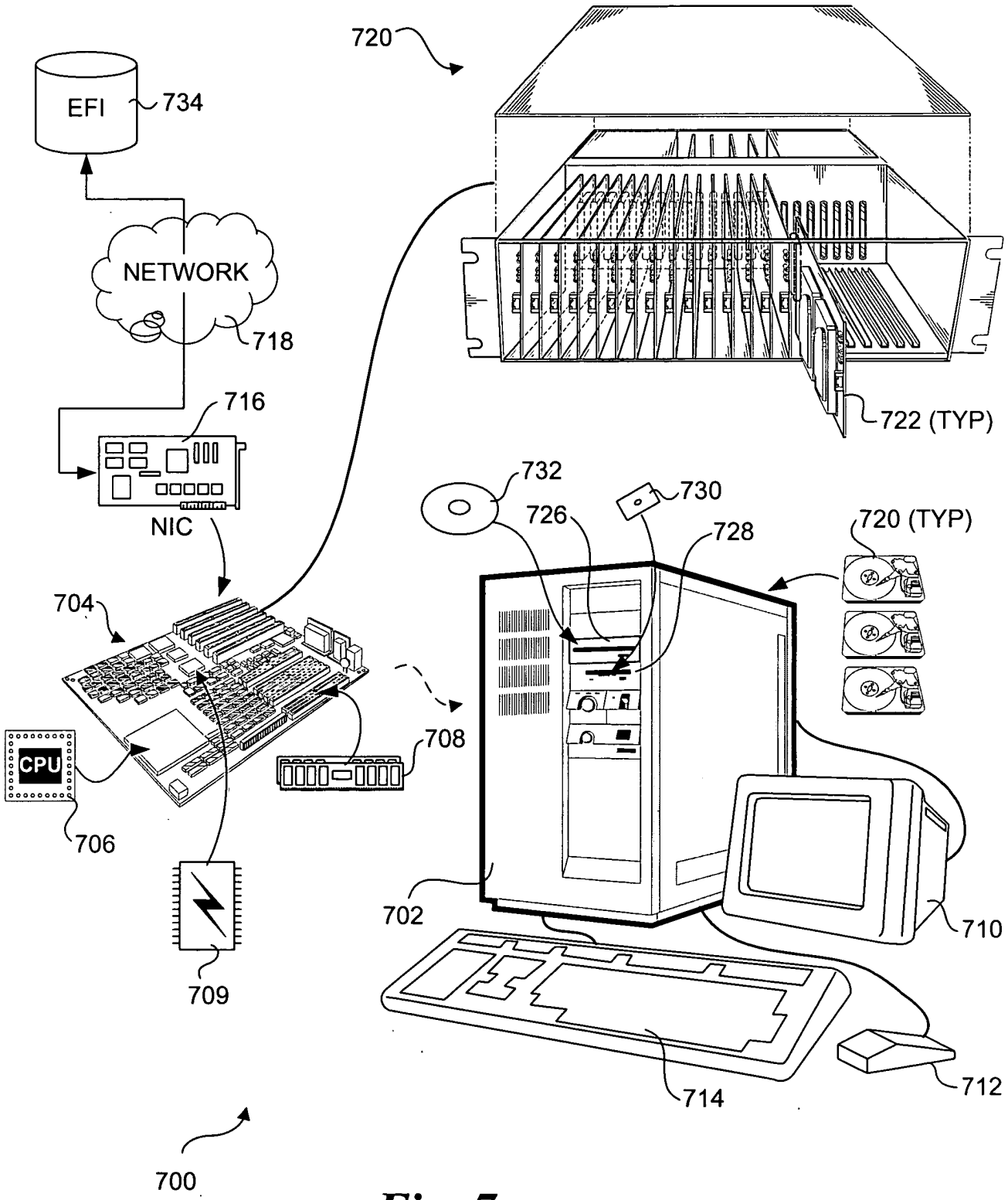

720
EFI
734
NETWORK
718
716
NIC
722 (TYP)
732
730
726
728
720 (TYP)
704
708
CPU
706
709
702
710
714
712
700

*Fig. 7*